PROCESS for Sawing Substrate Strips

~~Substrate-sawing Process for a Strip~~

Background of the Invention

1. Field of the Invention

The present invention relates generally to a substrate sawing process ~~for a strip~~ and more particularly to a ~~substrate sawing process by the multi-alignment on a strip~~.

2. Description of the Related Art

A conventional substrate sawing process comprises an alignment for positioning a substrate strip so as to adjust the position of a saw machine and to arrange the position of the cutting tracks for substrate sawing. As shown in FIG. 1, a substrate strip 100 comprises a plurality of areas 110 which are aligned along the longitudinal direction. The substrate areas 110 have a plurality of alignment marks 111 for positioning a saw machine and cutting marks 112 which are provided for measuring or predetermining arrangement of the cutting tracks 101 of the substrate sawing process. After the saw machine is positioned and the cutting tracks 101 are arranged, the saw machine saws the substrate strip 100 along the cutting track 101 which is defined by the cutting marks 112. However, the saw machine can choose only a set of the outermost alignment marks 111 of the substrate strip 100 to define a reference point and utilizes the cutting marks 112, located around the substrate areas 110, to predetermine the cutting tracks 101 in the first phase and the cutting tracks (not shown) in the second phase.

(INS. C1) The substrate strip 100 is packaged in high temperature circumstances and results in an expansion. When the substrate strip 100 returns to normal temperature, shrinkage in all dimensions occurs. However, each strip has variability which results in different amounts of shrinkage of the substrate strips 100 when returning from high temperature to normal temperature. Even if the substrate strips 100 are controlled in the same process and made of the same material, the shrinkage of the substrate strip 100 is still different. Therefore, each substrate strip 100 needs to be measured to define the cutting tracks in the first phase and the second phase. Then the saw machine detects the reference point of the alignment of the substrate areas 110 and moves to the predetermined position to cut the substrate strip 100 along the cutting tracks. Because the saw machine cuts the substrate strips 100 (which have

different shrinkage) by the predetermined cutting tracks 101, the cutting error A of each substrate area 110 adds to the peripheral substrate areas 110 in all dimensions on the substrate strips 100, even though the cutting tracks are predetermined.

Summary of The Invention

The present invention intends to provide a substrate sawing process that saws the substrate strips in alignment with each of the substrate areas. The saw machine is mechanically moved to the substrate areas and is positioned by the alignment of each of the substrate areas for the substrate sawing process. This reduces the cutting error in such a way as to mitigate and overcome the above problem. Because the saw machine is positioned on each of the substrate areas by corresponding alignment, a cutting error resulting from cutting of each substrate area cannot add to the peripheral substrate areas.

~~Summary of the Invention~~

INS. C2 The primary objective of this invention is to provide a substrate sawing process for a strip of substrate that includes multi-alignment so a sawing machine can be mechanically moved to the substrate areas and can be positioned by the corresponding alignments of each of the substrate areas to reduce the cutting error. Because saw machine is positioned on each substrate areas by corresponding alignment, a cutting error in any of the substrate areas ~~cannot add to the peripheral substrate areas~~. a2

~~The present invention is a substrate sawing process in accordance with an embodiment,~~ a3 the substrate sawing process mainly includes a4 multi-alignment marks corresponding to a plurality of substrate areas of substrate strips which are arranged side-by-side on a plate. A saw machine is mechanically moved to the substrate areas and is positioned by the alignments of corresponding substrate areas for cutting the substrate areas of the substrate strips in the first phase. And then the saw machine is further mechanically moved to the substrate areas again and is positioned by the alignments of corresponding substrate areas again for cutting the substrate areas of the strips in the second phase. Therefore, a cutting error in any of the substrate areas in the first phase and second phase ~~cannot add to the peripheral substrate areas~~. a5

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description and the accompanying

drawings.

Brief Description of the Drawings

The present invention will now be described in detail with reference to the accompanying drawings herein;

FIG. 1 is a top view of a plurality of cutting tracks of a strip;

FIG. 2 is a top view of the cutting tracks of a substrate strip in the first phase in accordance with the first embodiment of the present invention;

FIG. 3 is a top view of the cutting tracks of a substrate strip in the second phase in accordance with the first embodiment of the present invention;

FIG. 4 is a top view of the cutting tracks of a substrate strip in the first phase in accordance with the second embodiment of the present invention; and

FIG. 5 is a top view of the cutting tracks of a substrate strip in the second phase in accordance with the second embodiment of the present invention.

Detailed Description of the Invention

The substrate sawing process of the present invention mainly includes multi-alignment marks corresponding to a plurality of substrate areas of substrate strip or strips which are arranged side by side on a plate. A saw machine is mechanically moved to the substrate areas and is positioned by the alignments of corresponding substrate areas to cut the substrate areas of the strips in the first phase. Then the saw machine is further mechanically moved to the substrate areas again and is positioned by the alignments of corresponding substrate areas again to cut the substrate areas of the strips in the second phase. ~~Substrate sawing process of the present invention is also mainly adapted to cut a strip or juxtaposed strips in the first phase and in the second phase.~~

Referring to FIG. 2, ~~the sawing process of the present invention in accordance with the first embodiment~~, a substrate strip 100 is placed on a plate (not shown) and is preferably suctioned to attach to the top surface of the plate through the air-holes arranged on the plate. The substrate strip 100 comprises a plurality of substrate areas 110 which ~~is~~ are aligned in the longitudinal direction and a plurality of alignment marks 111

which ~~is~~ are arranged around the substrate areas 110. A saw machine (not shown) is mechanically moved to the substrate areas 110 and is positioned by the alignment marks 111 of corresponding substrate areas 110. Then the saw machine measures or predetermines the cutting tracks 101 by cutting marks 112 of each substrate area~~s~~ 110, and then cuts the substrate areas 110 of the substrate strip 100 in the first phase. The saw machine ~~utilizes multi alignment for positioning on the strip 100 and further utilizes a plurality of the cutting marks 112 to define the cutting tracks 101 in the first phase~~. Even though each of the strips 100 has unpredictable shrinkage caused by returning from high temperature to normal temperature, the saw machine is adjustably positioned in each of the substrate areas 110 by corresponding alignment marks 111 to avoid the error of each of the substrate areas 110~~, adding to the peripheral~~ substrate areas 110 during the next substrate sawing process. Therefore, the cutting error A of the substrate areas 110 is smaller than a predetermined value to provide accurate and controlled dimensions of the substrate. The alignment substantially consists of at least three points which are arranged around the encapsulated area of the substrate, and the cutting track substantially consists of two cutting marks which are arranged in the area formed by the alignment. ~~It follows that~~ Then the saw machine finds the reference point of alignment of each of the substrate strips 100 and cut each strip 100 along the predetermined cutting tracks in the first phase and the second phase to provide accurate and controlled dimensions of the singulated substrate.

Comparing FIG. 1 with FIG. 2, the conventional sawing process is comparable to the present invention in that the saw machine can choose only a set of the outermost alignment marks 111 of the substrate strip 100 to define a reference point and then utilizes the cutting marks 112, located around the substrate areas 110, to predetermine the cutting tracks 101 in the first phase. Because the substrate strips 100, which have unpredictable shrinkage, fail to contact the predetermined cutting tracks 101, accurate and controlled dimensions of the singulated substrate cannot be provided, and it cannot be applied to cut the substrate strip having ~~strip in~~ a plurality of substrate areas. However, the saw machine of the present invention is mechanically moved to the substrate areas 110 and is positioned by the alignment marks 111 of corresponding substrate areas 110 on which are arrayed a plurality of substrates in equidistance. Therefore it is easy to measure

the cutting marks 112 to define the cutting tracks 101, and the saw machine cuts each substrate strip 100 along the cutting tracks 101. The cutting error A of the substrate areas 110 is smaller than a predetermined value to provide accurate and controlled dimensions of the substrate.

Referring to FIG. 3, the saw machine measures or predetermines the cutting tracks 102 by cutting marks 112 of each of the substrate areas 110 in the second phase, and the cutting tracks 102 are restricted in each of the substrate areas 110. The substrate strip 100 is cut along the cutting tracks 101 and the cutting tracks 102 to form the substrate of the semiconductor device.

Referring to FIG. 4, all ~~the sawing process of the present invention in accordance with the second embodiment, a strip 100 and a strip 200 juxtapose~~ on a plate (not shown). The substrate strips 100 and 200 have a plurality of substrate areas 110 and 210 which are adjacent to one another. The saw machine cuts the substrate strips 100 and 200 along the cutting tracks 101 in the first phase.

Referring to FIG. 5, the saw machine cuts the substrate strips 100 and 200 along the cutting tracks 102 in the second phase which is restricted in each of the substrate areas 110 and 210. The substrate strips 100 and 200 are cut along the cutting tracks 101 and the cutting tracks 102 to form the substrate of the semiconductor device. then ~~It follows that~~ the saw machine find the reference point of alignment of each of the substrate strips 100 and 200 and cuts each substrate strip 100 and 200 along the predetermined cutting tracks in the first phase and the second phase.

Although the invention has been described in detail with reference to its present preferred embodiment, it will be understood by one of ordinary skill in the art that various modifications can be made without departing from the spirit and the scope of the invention, as set forth in the appended claims.